

Occasional Papers On Mollusks

Published by
THE DEPARTMENT OF MOLLUSKS
Museum of Comparative Zoology, Harvard University
Cambridge, Massachusetts

VOLUME 3

FEBRUARY 24, 1967

NUMBER 37

Notes on *Pleurobema collina* (Conrad) from the James River, Virginia

By KENNETH J. BOSS AND WILLIAM J. CLENCH

One of the most remarkable characteristics of the molluscan fauna of the Atlantic coastal drainage of North America is the existence of two species of pearly fresh-water mussels which bear spines on the disk and posterior slopes of their valves. Lea (1836) described *Elliptio spinosa* from the Altamaha River in Georgia, and the species, long thought to be extremely rare or even extinct, has recently been collected in that drainage system (Tomkins, 1955; Clench, 1962; Thomas and Scott, 1965). The other spinose species, the *Unio collinus* of Conrad, from the James River, Virginia, has also recently been "re-discovered" (Clench and Boss, 1967). No other unionaceans exhibit such clearly differentiated and elongated spinosities on their valves and this unusual structure has been used as a basis to unite both species in a distinct subgenus, *Canthyria* Swainson 1840 by Frierson (1927).

With preserved animals of both species and an excellent suite of fresh material from both river systems, we have been able to show that the species really belong to distinct lineages and that the spines are convergent characteristics.

Pleurobema collina (Conrad)

Plate 15, figs. 1-3

Unio collinus Conrad 1836 (December), Monography of the family Unionidae. . . , Philadelphia, No. 7, pl. 36, fig. 2, plate caption only; 1837 (February), *Ibid.*, No. 8, p. 65 (type-locality, inhabits North River, Virginia; ANSP 20408, 3 specimens); Troschel 1838, Arch. für Naturg., 4 (2): 287; Conrad 1840 (June),

Ibid., No. 12, pl. 60, fig. 3; Conrad 1846, Amer. Jour. Sci. (2), **1**: 405-7; Conrad 1853, Proc. Acad. Nat. Sci. Philadelphia, **6**: 247; Hanley 1856, Bivalve Shells, p. 382, pl. 2, fig. 57; Küster 1861, Conch. Cab. (2), **9** (2): 188, pl. 59, fig. 5; Sowerby 1866, Conch. Icon., **16**: [No. 1], *Unio*, pl. 49, fig. 263; Wright, 1888, Check List, p. 2 [unnumbered]; Paetel 1890, Cat. Conch. Samm., 4th Ed., **3**: 148.

Margaron (Unio) collinus (Conrad). Lea 1852, Synopsis, p. 23; 1870, *Ibid.*, p. 35.

Alasmidonta collina (Conrad). Simpson 1900, Proc. U.S. Nat. Mus., **22**: 669; Ortmann 1913, Proc. Amer. Phil. Soc., **52** (210): 320-1; Simpson 1914, Descriptive Catalogue Naiades **1**: 501; Clench and Boss, 1967, Nautilus, **80**: 100.

Canthyria collina (Conrad). Frierson 1927, Check List of the North American Naiades, p. 46.

Description. Shell extending to 55 mm. in length, 35 mm. in height and 21 mm. in width, irregularly subrhomboid, inequilateral, equivalve, rather solid but not heavy, slightly inflated with both valves of equal tumidity. Umbos anterior, prosogyrous, not elevated above hinge line, not inflated, eroded in adults; umbonal cavity shallow; umbonal sculpture consisting of 3-4 strong subconcentric bars. Anterior margin convex and rather broadly rounded; ventral margin straight to concave centrally; dorsal margin weakly convex; posterior margin long, straight to convex, and forming oblique truncation, sometimes with short irregular postbasal portion. Sculpture consisting of undifferentiated concentric growth rings and of short differentiated bilateral spines disposed on posterior dorsal slope and posterior quarter of disk. Posterior ridge weakly developed, forming biangulation postbasally. Ligament opisthodic, yellowish to blackish brown and set on weakly developed nymphal callosities. Hinge line relatively well developed. In right valve, subumbonal pseudocardinal tooth strong, subdeltoid, angular, dorsally rugose; also narrow marginal dorsal pseudocardinal sometimes developed; flat cardinal plate subdentate; posterior lateral tooth rather short, oblique, posteriorly pointed and ventrally rugose. In left valve, two anterior pseudocardinal teeth developed, strong protuberant, subdeltoid; two rather short, obliquely descending parallel posterior lateral teeth. Anterior pedal and adductor muscle scars particularly well impressed. Nacre white with suffusion of blue posteriorly; externally yellowish in immatures to brownish in adults; rarely rayed with fine, narrow, broken, brownish line. Supraanal opening long, narrow, and separated from anal aperture by short, well

developed mantle fusion. Excurrent aperture weakly papillose; papillae basally and laterally fused to inner mantle lobe, dark brown with whitish types in preserved specimens. Incurrent aperture with numerous, well developed papillae, not fused laterally, free and subtentaculate, brownish with white tips. Gills not fused to body wall dorsally; outer demibranch smaller than inner; marsupium in external demibranch of female. Preserved animals generally greenish white.

length	height	width	
55.0 mm.	34.7 mm.	20.3 mm.	Rivanna River
50.7	32.1	19.5	James River, Maidens
44.4	27.0	17.0	" " "
37.0	23.8	12.5	James River
29.5	20.0	10.1	Calfpasture River
21.4	14.3	7.8	" "
15.2	9.7	4.0	North Carolina

Remarks. Measurements of 50 specimens of *Pleurobema collina** indicate an ontogenetic pattern in the formation of the spines on the posterior slope of the valves. Usually the maximum number of pairs of spines is three and they are most often nearly bilaterally symmetrical. The first set of spines are developed about 3-4 mm. from the umbo; the second, at 6-8 mm.; and the third, generally more irregularly formed and disposed, from 10-17 mm. The largest spines approach 5 mm. in length and a thickness of more than 1.5 mm. The spines are originally hollow, being closed ventrally at the end of their formation and finally solidified later (Plate 15, fig. 3). Lengths, heights, and widths of shells and the ratios of length/height (mean, 1.55) and length/width (mean, 2.74) exhibit a considerable range of variation. One slightly detectable trend includes the tendency of adult shells to be proportionately more elongate and less subrhomboid than small shells. Fortunately a few specimens of known sex were available, and it appears that shells of females are slightly more rotund than those of the males.

Anatomically, *P. collina* is similar to *P. masoni* of the Atlantic drainage and other *Pleurobema* in the Mississippi drain-

* According to R. I. Johnson (pers. comm.), *Lexingtonia* is synonymous with *Pleurobema* and what has been called *Lexingtonia subplana* (Conrad) is actually referable to *Pleurobema masoni* (Conrad).

age (Ortmann, 1912). In *collina*, the sexes may be distinguished by the structure of the gills. Females have more closely set filaments in the outer demibranch, and though this is admittedly a character which is neither truly meristic nor easily detectable, combined with the thickened ventral margins of the gill, it serves to identify a female specimen and to indicate that the marsupium occupies only this demibranch. Since all preserved material was collected in August or early September and no gravid females were found, the species is probably tachytictic (Ortmann, 1911) or a short term breeder, releasing the developing embryos as glochidia during the summer. Reporting on *P. masoni*, Ortmann (1914) found gravid females in early June in the James River drainage.

In *collina*, the supraanal opening is moderately elongate and separated from the excurrent aperture or anal opening by a short, well developed, mantle fusion. The papillae in the excurrent aperture are, though comparatively distinct, actually fused basally and laterally to the mantle; the papillae of the incurrent opening consist of two irregular rows, the outermost similar to the fused papillae of the excurrent aperture, and the innermost free to their bases, more highly differentiated and larger.

The close relationship of *P. masoni* and *P. collina* is not only indicated by the similar anatomical structures found in both species but is also corroborated by the character of their shells. Both have similarly shaped shells that are typically yellowish brown in color. The well developed left lateral dentition, consisting of two lamellae, and the most important strong, bar-like, subconcentric umbonal sculpture, usually only observed in immature specimens, are virtually identical (Plate 15, figs. 1, 2).

Plate 15

Fig. 1. Dorsal view of *Pleurobema masoni* (Conrad) (length 16.5 mm.; MCZ 261312), James River, Maidens.

Fig. 2. Dorsal view of *P. collina* (Conrad) (length, 18.8 mm.; USNM 84376).

Fig. 3. Ventral view of hollow spine of young *P. collina* (length of spine, 4.7 mm.; USNM 84376). Specimens in figs. 1 and 2 sprayed with ammonium chloride vapor.

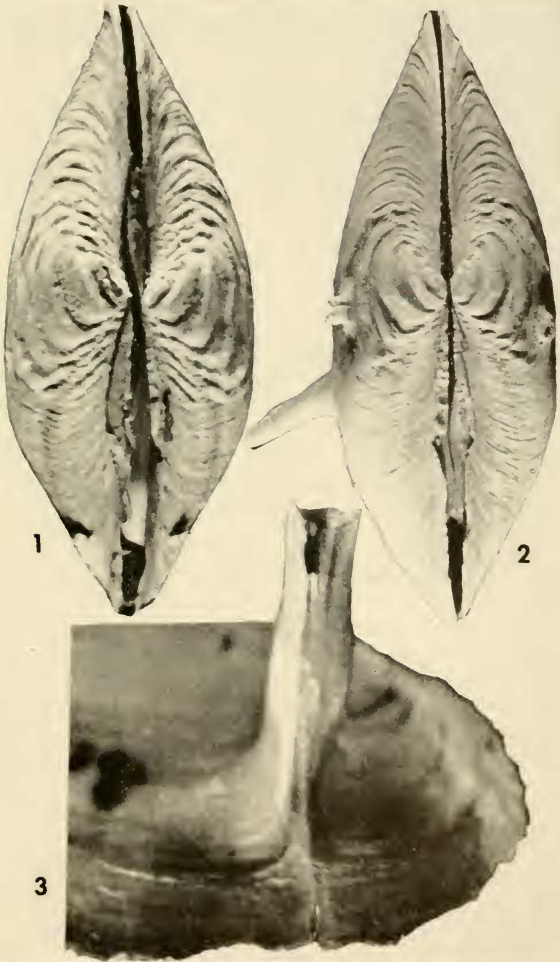


Plate 15

That Simpson (1900; 1914) relegated *P. collina* to *Alasmidonta* is certainly surprising. He compared *P. collina* with *A. heterodon* and stated that it was more closely related to *A. heterodon* than to any other species. Conchologically, *P. collina* and *A. heterodon* are very distinct, particularly in regard to the pseudocardinal and lateral dentition. Although variable, the left valve of *A. heterodon* has thin, rather weak dentition; the pseudocardinal teeth are small, laminate and compressed; there is usually an anterior shelf-like element and a compound subumbonal element composed of one to three poorly-defined teeth. The posterior lateral tooth of *A. heterodon* is usually a single, narrowly elongate structure. In *P. collina*, there are two pseudocardinals which are strong, protuberant, subdeltoid and heavy; the two posterior lateral teeth are strong, moderately long, and slightly inclined to the dorso-ventral axis of the shell. In general, the external coloration of *P. collina* is yellowish brown while that of *A. heterodon* is greenish black.

The development of spines in *P. collina* and *Elliptio spinosa*, led Frierson to place these species in a distinct group, *Canthyria* Swainson; however, conchologically there is every reason to recognize that these species are of separate lineages. Primarily, they have completely different umbonal sculpture, a character of generic significance. *P. collina* has strong sub-concentric bar-like rugosities (Plate 15, fig. 2). The umbonal sculpture in *E. spinosa* is obsolete, consisting of weak, very irregular protuberances. In addition, the shape of the shells of each species is distinctive. *P. collina* is irregularly subrectangular with the postbasal arcuation in adults ventrally directed while in *E. spinosa* the ventral margin is distinctly convex and the shell is pointed behind. In young individuals, *P. collina* is yellowish in coloration while *E. spinosa* is predominantly greenish. On the other hand, adults are greatly different: *E. spinosa* being black and *P. collina* yellowish-brown. The nacre is purple in *E. spinosa* and white in *P. collina*. The umbo of *E. spinosa* is more centrally located and its anterior dorsal margin more extensive than that of *P. collina*. The spines of both species, though fundamentally similar, are stronger, longer and more numerous in *E. spinosa*. The medial pseudocardinal of the left valve of *E. spinosa* is reduced while the homologous tooth in *P. collina* is strong and subdeltoid;

the two posterior lateral teeth in *E. spinosa* are more strongly inclined to the dorso-ventral axis of the shell than they are in *P. collina*.

Range. *Pleurobema collina* is a rare species which inhabits sandy substrates usually in shallow water in the reaches of the James River above Richmond, and its tributaries, the Rivanna and the North in Virginia, as well as the Tar River in North Carolina.

Specimens examined. VIRGINIA: James River (MCZ); James near Maidens, Goochland Co. (MCZ; USNM); James River, near Natural Bridge, Rockbridge Co. (USNM); James River, Buchanan, Botetourt Co. (MCZ); Rivanna River, 2 mi. W of Columbia, Fluvanna Co. (MCZ); Calfpasture River [= North River, = Maury River] (MCZ; USNM). NORTH CAROLINA: (USNM); Tar River, Old Sparta, 3½ mi. W of Pine Tops, Edgecombe Co. (Ohio State Museum).

ABBREVIATIONS

MCZ — Museum of Comparative Zoology, Harvard University,
Cambridge, Massachusetts

USNM — United States National Museum, Washington, D.C.

ACKNOWLEDGMENTS

Mr. R. I. Johnson and Dr. J. Rosewater critically read the manuscript. Specimens were loaned by the U. S. National Museum, and Dr. J. P. E. Morrison sent us preserved animals. The photographs were taken by Dr. J. E. Chimoskey of the Retina Foundation, Boston.

BIBLIOGRAPHY

- Clench, W. J. 1962. Collecting freshwater mollusks in south central Georgia. *Shells and Their Neighbors*, no. 12, pp. 1, 7.
- Clench, W. J. and K. J. Boss. 1967. Freshwater Mollusca from the James River, Virginia, and a new name for *Mudalia* of authors. *Nautilus* **80** (3): 99-102.
- Frierson, L. S. 1927. A classified and annotated check list of the North American Naiades, Baylor University Press, Waco, Texas, pp. 111
- Lea, I. 1836. Description of a new species of *Unio* [*spinosus*], pp. 4, colored figs.
- Ortmann, A. E. 1911. Monograph of the Najades of Pennsylvania. *Mem. Carnegie Museum*, 4 (6): 279-347, pls. 86-89.
- Ortmann, A. E. 1912. Notes upon the families and genera of the Najades. *Ann. Carnegie Museum*, No. 72, **8** (2): 222-365, pls. 18-20.
- Ortmann, A. E. 1914. Studies in Najades. *Nautilus*, **28** (3): 28-30.
- Simpson, C. T. 1900. Synopsis of the Naiades, or pearly Freshwater Mussels. *Proc. U.S. Nat. Mus.*, **22** (1205): 501-1044.
- Simpson, C. T. 1914. A descriptive catalogue of the naiades, or pearly freshwater mussels. Parts 1-3, pp. 1540, Bryant Walker, Detroit, Michigan.
- Thomas, G. J. and D. C. Scott. 1965. Note on *Elliptio spinosa* in Georgia. *Nautilus*, **79** (2): 66-67.
- Tomkins, I. R. 1955. *Elliptio spinosus* in the Altamaha River, *Nautilus*, **68** (4): 132-133.